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I further certify that the above application is now proceeding in the name of INNOVATIVE MOTORCYCLE TECHNOLOGY PTY. LTD pursuant to the provisions of Section 113 of the Patents Act 1990.


WITNESS my hand this
Eleventh day of August 2003

J. Billingsley

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**Australia**
**Patents Act 1990**

**Provisional Specification**
**Provisional Patent**

# COMBINED CLUTCH and BRAKE LEVER with HYDRAULIC ACTIVE ANTI-STALL

**The invention is described in the following statement:**

# Combined Clutch and Brake Lever with Hydraulic Active Anti-Stall

## Description

This invention is intended to improve the controllability of a motorised vehicle fitted with a clutch and brake.
It is based on the fact that both the clutch and brake functions control (within the constraints of gear selection and throttle settings) the rotational speed of the driven wheels.

To assist in the understanding of the invention reference will now be made to the attached drawings. The example shown in the drawings and described in the following dialogue was designed for use on a motorcycle as a finger operated control, however this system could also be used in any other vehicles that have a clutch and a brake system or to control both front and back brakes of a vehicle instead of the brake and clutch application described.
This example of the invention consists of a Main Lever (5) that operates two hydraulic master cylinders simultaneously via an independent Rocker Arm (6). This Rocker Arm (6) is also able to be operated independently or simultaneously by the Pedal Operated Arm (7). All of these three, (5), (6) and (7) pivot at the Main Pivot Point (8). There are two adjustable master cylinder pushrods, the Brake Master Cylinder Pushrod (13) and the Clutch Master Cylinder Pushrod (16). These pushrods are positively attached via pivots to, at one end their respective Master Cylinder Pistons, (14) and (17) and at the other end the Rocker Arm (6).This Rocker Arm (6) features a Spring (15) that via the Pushrods (13) and (16) pulls back the Master Cylinder Pistons (14) and (17). However this Spring is positioned in such a way relative to the Main Pivot Point (8) that it only pulls back the Pistons (14) and (17) in the last part of their return travel. The initial portion of the Pistons return travel is caused by system pressure. The other Spring shown (18) holds the Main Lever (5) against the Adjuster (19) for the Rocker Arm (6). This Spring (18) allows the Lever to fold out to prevent accident damage and also prevents the operators hand from being trapped between the Spindle (9) and the Handlebars (12) when the Rocker Arm (6) is being operated via the Pedal (20).To pull the Main Lever (5) in towards the handlebars the operators finger or fingers are wrapped over the Spindle (9) and the Spindle and consequently the Main Lever (5) pulled in the direction 'A'. This Spindle (9) is able to rotate freely in relation to the Main Lever (5). The ability of the Spindle (9) to rotate freely is to reduce the friction and therefore the effort required to pull the Main Lever (5) in direction 'A'. In addition to the Spindle being able to move in direction 'A' it is also able to move in towards the centreline of the vehicle, i.e in direction 'C'. Note a combination of a Spring (21) and a Spring loaded Ball and Detent holds the Spindle in a position away from the centreline of the vehicle, i.e in direction 'B'. Moving the Spindle in direction 'C' activates the Brake Switch Solinoid (10).
In the simple system shown in figure one and figure three the switch operates the Brake Solinoid (1). Note this solenoid is of the normally closed variety.
The Brake Solenoid (1) when activated opens a port in the Brake Master Cylinder that returns hydraulic pressure from the Brake Master Cylinder to the reservoir. This release of pressure from the Brake Master Cylinder allows the Brake Master Cylinders Piston (14) to travel further in its stroke until the Piston (14) closes the Brake Cylinder Solenoids Port. At this point hydraulic pressure will be able to be generated by further travel of the Brake Master Cylinder Piston.
Because the Clutch Master Cylinder Piston (17) is connected to the Brake Master Cylinder Piston (14) via their respective pushrods (16) and (13) and both connected to the Rocker Arm (6), movement of the Brake Master Cylinder Piston will cause the same movement in the Clutch Master Cylinder Piston (17). This movement of the Clutch Master Cylinder Piston (17) generates hydraulic pressure in the Clutch Master Cylinder causing the Clutch to be operated. In addition to being able to open the Brake Master Cylinder Solenoid (1) using the Spindle (9) operated Switch (10), the Brake Master Cylinder Solenoid (1) is also controlled by an engine R.P.M activated switch.

Figure Three shows a simple diagram showing details of the electrical control of the Brake Master Cylinder Solenoid. The R.P.M Activated Switch (25) opens the Brake Master Cylinder Solenoid (1) if the engine R.P.M falls below a predetermined value. This means in practice that if the operator pulls the Main Lever (5) towards the handlebars with the Spindle (9) in Position 'B' both the clutch and brake functions are operated simultaneously but by adjustment of the Pushrods (13) and (16) the brake can be effectively operated before the clutch disengages. Adjusted in this fashion as the operator pulls the Main Lever (5) towards the Handlebars (12) with the Spindle (9) in Position 'B' the Brake is applied. During this application of the brakes if the engine R.P.M falls below the predetermined value the Brake Master Cylinder Solenoid (1) is operated thus disengaging the clutch and preventing the motor from stalling. Further travel of the Main Lever (5) once the Brake Master Cylinder Solenoid (1) port is closed off by the Brake Master Cylinder Piston (14) operates the brakes without risk of stalling because the clutch is now fully disengaged.
Pulling the Main Lever (5) in towards the handlebars (12) with the Spindle (9) pushed in Direction 'C' operates first the clutch and then the brakes and is the same as if the R.P.M Switch is activated.
Figure Two and Four show a more complex system to enable better control over the rotational speed of the driven wheel(s). This system employs two additional solenoids, a Clutch Master Cylinder Solenoid (2) and a Anti-Stall Solenoid (3). The Clutch Master Cylinder Solenoid (2) functions in the same way as the Brake Master Solenoid (1). The Anti-Stall Solenoid (3) which is operated by the R.P.M Switch opens a port in the Brake Master Cylinder that feeds pressure into the Clutch Master Cylinder.
Table One shows which valves are open or closed for the more complex system shown in Figure Four. Note the brake function is selected by the Spindle (9) being in Position 'B'. The clutch function is selected by the Spindle (9) being in position 'C'.
The Anti-Stall function is activated by the control unit based on engine R.P.M but with the potential to use a 3D Map subject to other inputs such as the one's shown in Figure Two.
The Hydraulic circuit shown in Figure Four is for the more complex system but represents the simple system if the Solenoids (2) and (3) are taken as permanently closed. Table Two represents the state of the Solenoid relative to the function employed in this simple system.
Referring to Figure one a Cable Operated Arm (7) is shown This Arm is operated remotely by a conventional foot pedal via a cable. This Arm means that the force required to operate the Master Cylinders can be wholly or partially provided by the operators foot. The position of the Spindle will however still control which function is operated first and the Anti-Stall function will still operate.
Figure Five shows another possible system of Levers by which the Master Cylinders may be operated. This system means that the Spindle (9) will remain parallel to the Handlebars (12) throughout its travel.

Notes:
For ease of understanding, the main bracket is not shown in the drawings. This bracket will be assumed to locate the position of the following components relative to the handlebars:

1. Main Pivot Point (8)
2. Brake Master Cylinder (26)
3. Clutch Master Cylinder (27)
4. Fluid Reservoir (4)
5. Backstop Adjusters for Rocker Arm (6), Main Lever (5) and the Pedal Operated Arm (7)
6. the Adjuster for the Pedal Operation Cable.

This bracket is clamped around the Handlebars (12) so as to allow the position of the whole assembly to be changed.
Also note that the Rotary Spindle (9) could be replaced by a non-rotating slide to operate the Switch (10).

With the more complex system shown in Figure Four and Two it is possible to use a three position switch instead of Switch (10). This switch could then offer the following functions;

1. Brake Function (operates the brake first)
2. Neutral Function (operates both functions but with a overlap)
3. Clutch Function (operates clutch first then brake)

Also with this system the Switch (10) could be replaced with a linear potentiometer to allow greater adjustability of functions.
Also both systems could use Pulse Width Modulation to achieve greater control and also to reduce power consumption.
The Brake Pedal is not shown but is of conventional design and its operation pulls via a cable the Arm (7). Note also that this Pedal operation could be optional. Also note its operation could also be Hydraulic
The Switch (10) could be replaced by the movement of the Spindle operating a Spool Valve to change the functions. This Spool Valve could also be activated by the Control Unit.

It will be realised that the Combined Clutch and Brake Lever with Hydraulic Active Anti-Stall according to this invention is not restricted to the use of hydraulic cylinders as shown in the example, but may use other suitable forms of operating the brake or clutch, for example pneumatic, electric or any other means by which the brake or clutch can be effectively activated. It will be further realised the leverage ratios and hydraulic cylinder sizes shown are for example only and a individual vehicle may require re-positioning of pivot points, changing of leverage ratios or cylinder sizes or the use of power assistance to increase efficiency.

**OWEN HUTCHISON** **11TH JANUARY 2003**

1. Brake Solenoid
2. Clutch Solenoid
3. Anti-Stall Solenoid
4. Fluid Reservoir
5. Main Lever
6. Rocker Arm
7. Pedal Operated Arm
8. Main Pivot
9. Spindle
10. Switch
11. Cable for Pedal Operation
12. Handlebar
13. Adjustable Brake Pushrod
14. Brake Master Cylinder Piston
15. Rocker Return Spring
16. Adjustable Clutch Pushrod
17. Clutch Master Cylinder Piston
18. Main Lever Spring
19. Rocker Arm to Main Lever Adjuster
20. Foot Operated Pedal
21. Spindle Return Spring
22. Spring Loaded Ball and Detent (to facilitate tactile indication of the position of the spindle)
23. Wires from the brake solenoid
24. Wire from brake solenoid switch
25. R.P.M Activated Switch
26. Brake Master Cylinder
27. Clutch Master Cylinder
28. Pedal Operation Cable Adjuster
29. Main Bracket
30. Rocker Arm Backstop Adjuster
31. Pedal Arm to Rocker Arm Adjuster
32. Ball and Spring Detent for tactile indication of commencement of brake function
33. Pedal Arm Backstop Adjuster

## Abstract

A single lever fitted with a sliding control to facilitate the operation of the brakes and or clutch of a motorised vehicle also featuring an electronic override system to help prevent engine stall.

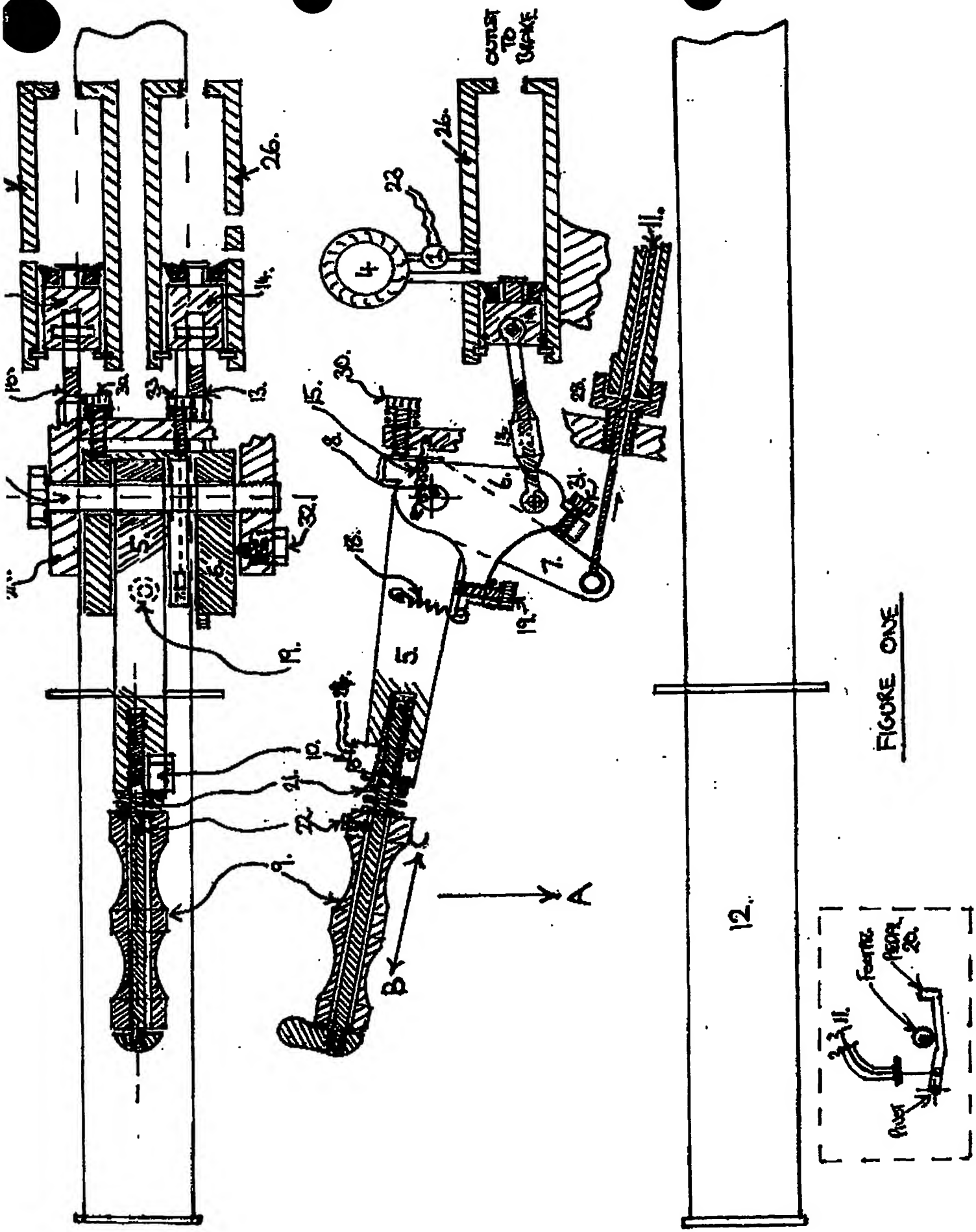


FIGURE ONE

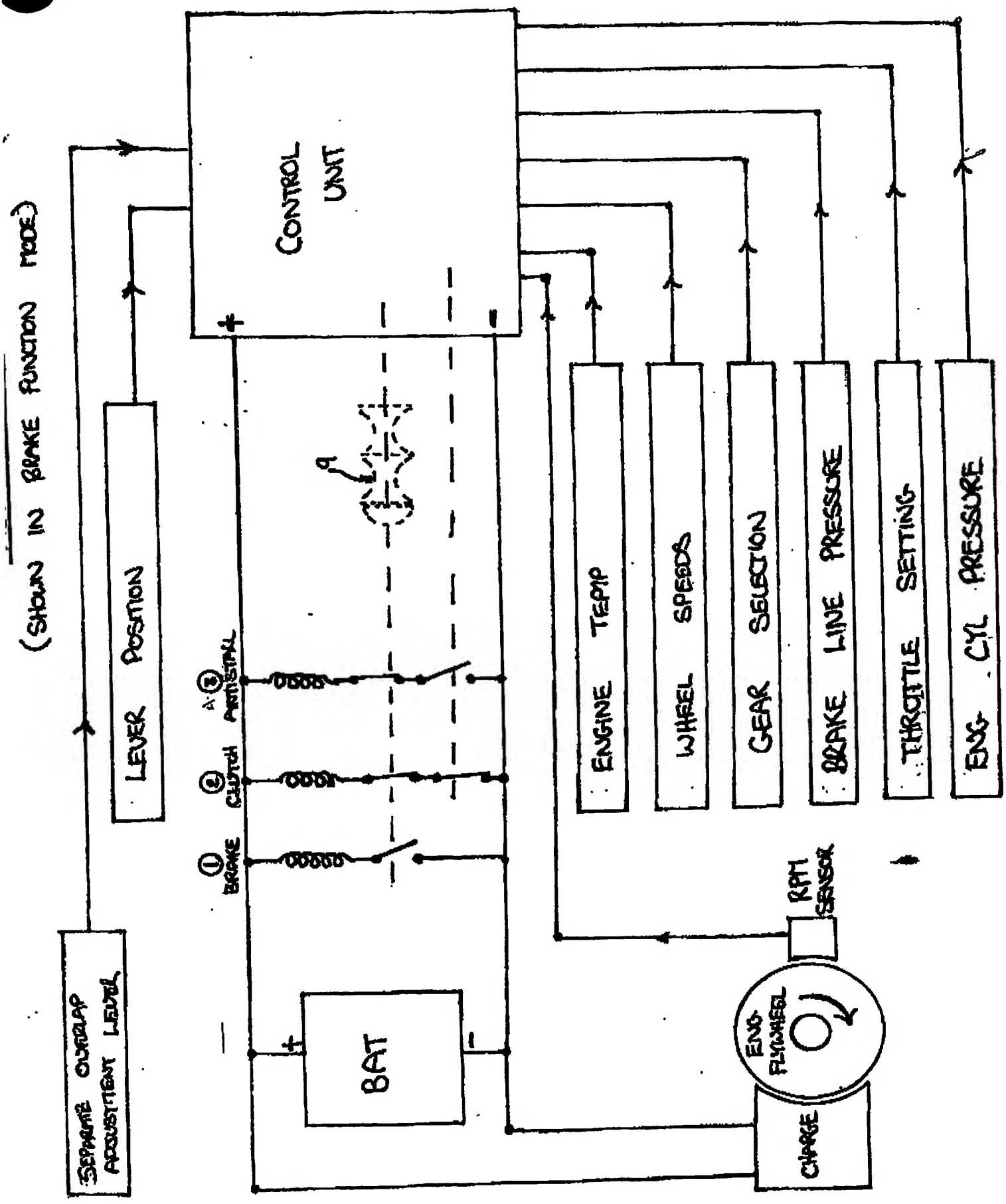
(SHOWN IN BRAKE FUNCTION MODE)
CONTROL UNIT
LEVER POSITION
SEPARATE OVERLAP ADJUSTMENT LEVER
3 ANTISTALL
2 CLUTCH
1 BRAKE
BAT
+
-
ENGINE TEMP
WHEEL SPEEDS
GEAR SELECTION
BRAKE LINE PRESSURE
THROTTLE SETTING
ENG. CYL PRESSURE
RPM SENSOR
ENG. FLYWHEEL
CHARGE

FIGURE THREE

(SHOWN IN BRAKE FUNCTION MODE)

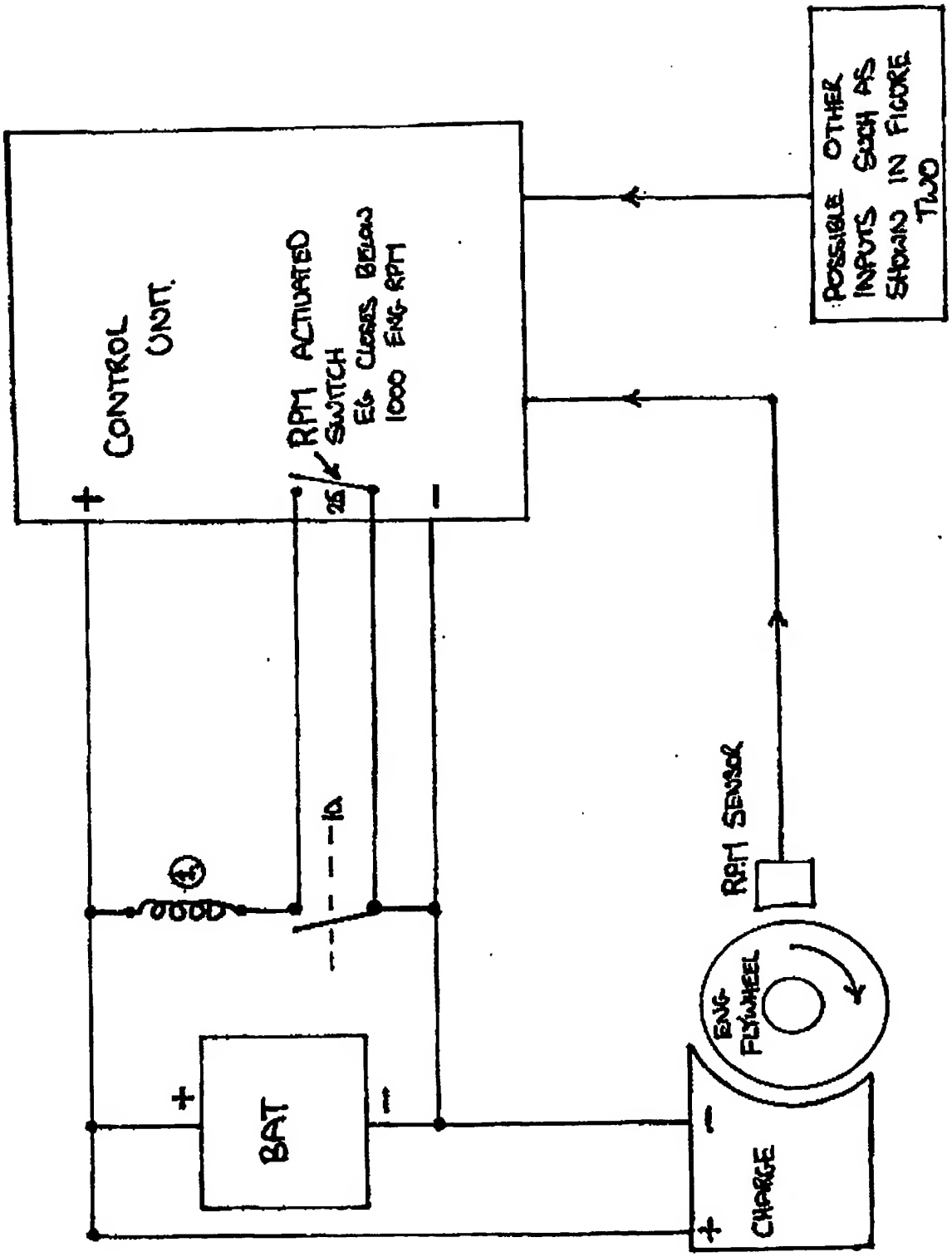

TABLE ONE

| FUNCTION | OPEN | CLOSED |
|---|---|---|
| BRAKE | 2 | 13 |
| CLUTCH | 1 | 23 |
| ANTISTALL | 3 | 12 |

TABLE TWO

| FUNCTION | OPEN | CLOSED |
|---|---|---|
| BRAKE | | 1 |
| CLUTCH | 1 | |
| ANTISTALL | 1 | |

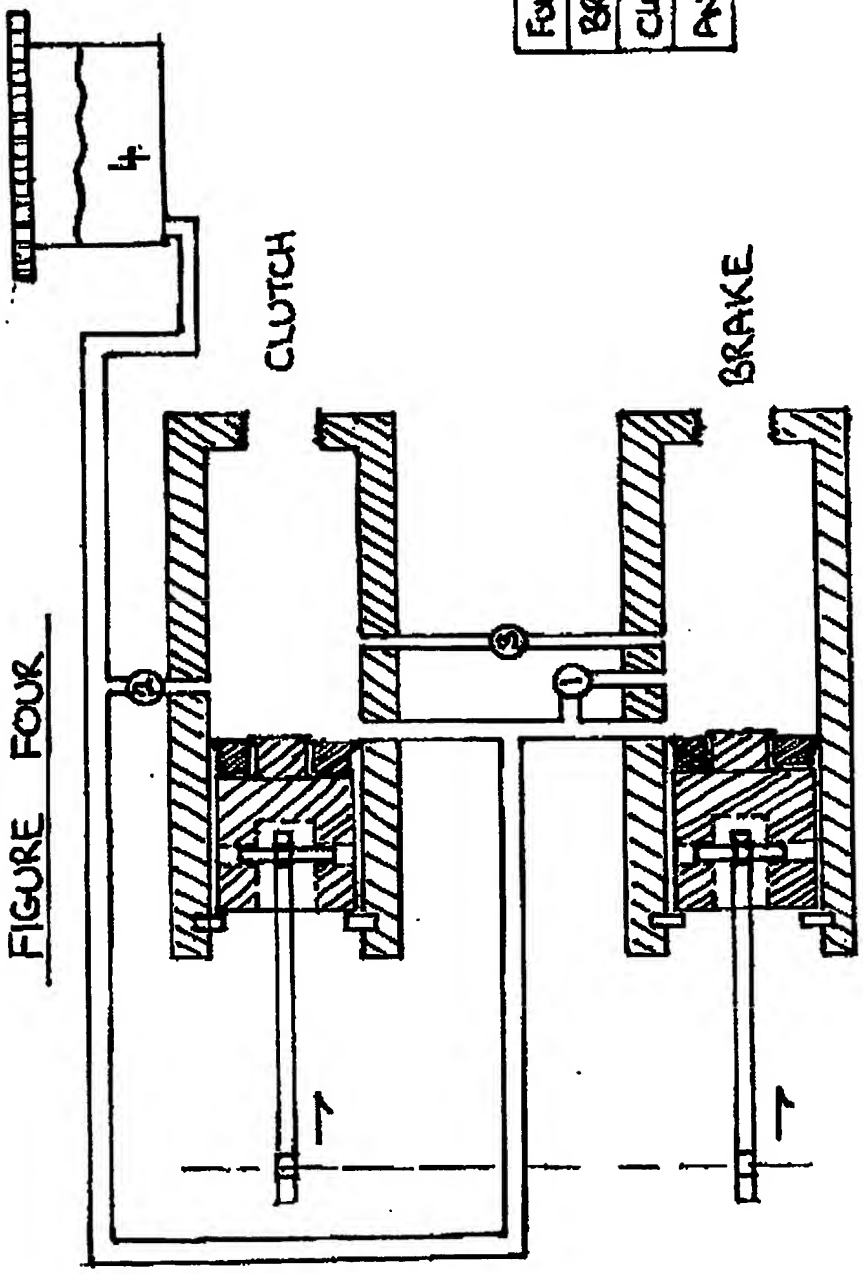


FIGURE FOUR

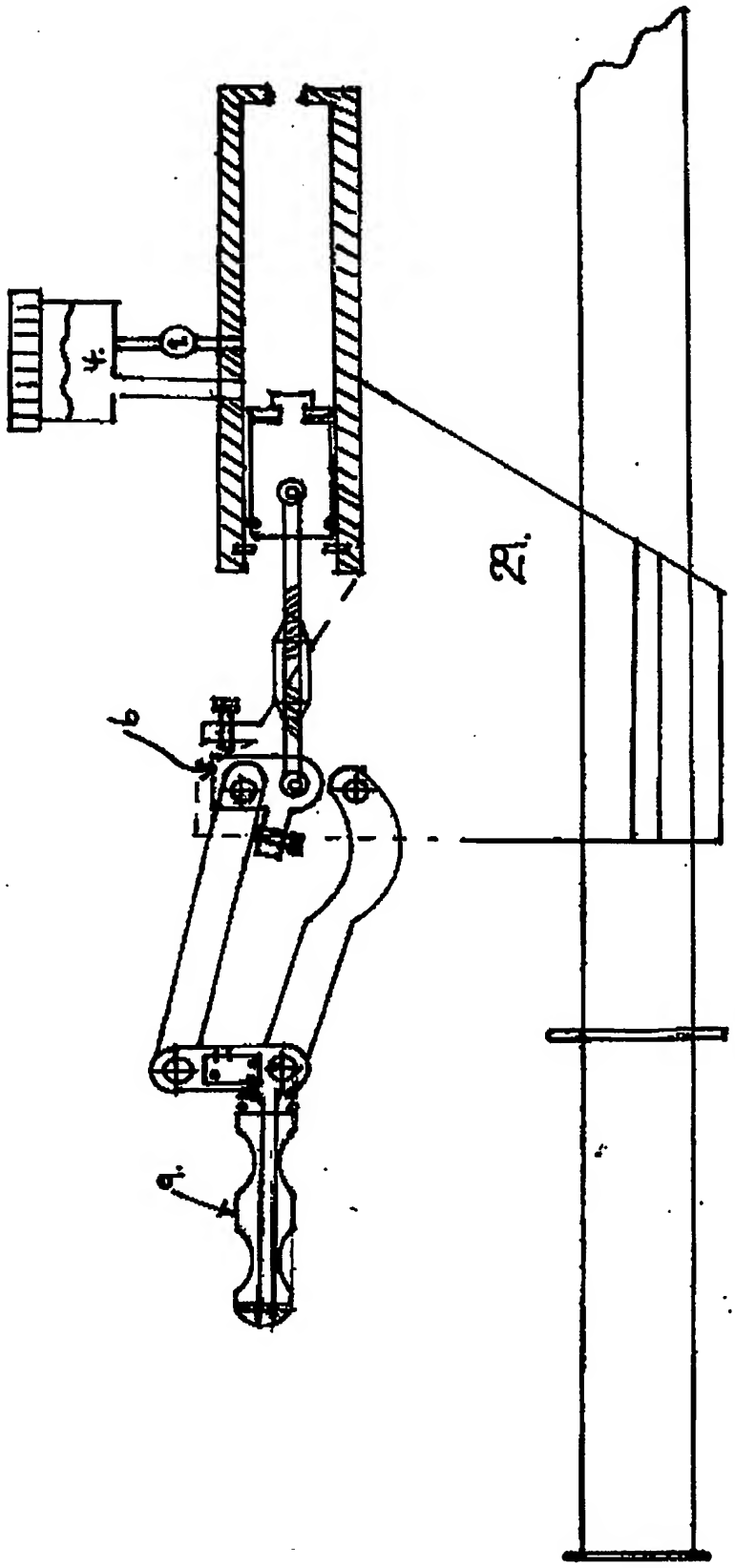


FIGURE FIVE